

926 ~~Claims:~~ We claim:

1. A method for remote real time oil field management, comprising:
 - a) installing at least one sensor in an oil field;
 - b) coupling the at least one sensor to a CPU with memory located at the oil field;
 - c) programming the CPU to collect and store data from the at least one sensor;
 - d) coupling the CPU to the Worldwide Web; and
 - e) providing remote access to the data via the Worldwide Web.
2. A method according to claim 1, further comprising:
 - f) programming the CPU to at least partially analyze the data; and
 - g) providing remote access to the at least partial analysis via the Worldwide Web.
3. A method according to claim 2, wherein:

said step of programming the CPU to at least partially analyze the data includes programming the CPU to determine whether data falls outside programmed bounds.

4. A method according to claim 2, wherein:

said step of programming the CPU to at least partially analyze the data includes programming the CPU to determine whether the data is following a trend.

5. A method according to claim 2, wherein:

said step of programming the CPU to at least partially analyze the data includes programming the CPU to determine whether a function of the data falls outside programmed limits.

6. A method according to claim 2, wherein:

said step of programming the CPU to at least partially analyze the data includes programming the CPU to apply a correlation function.

7. A method according to claim 2, wherein:

said step of programming the CPU to at least partially analyze the data includes programming the CPU to determine covariance of the data.

8. A method according to claim 2, further comprising:

h) programming the CPU to determine whether the results of the at least partial analysis correspond to an anomaly; and

i) programming the CPU to automatically notify one or more persons if the results of the at least partial analysis correspond to an anomaly.

9. A method according to claim 8, wherein:

said step of automatically notifying includes one of sending electronic mail, calling a pager, calling a telephone number, activating an alarm, broadcasting an RF signal, transmitting a signal to a satellite, transmitting a microwave signal, sending a signal via a LAN, or sending a signal via a WAN.

10. A method according to claim 8, further comprising:

j) programming the CPU to perform specified functions if it does not receive an acknowledgement in response to the automatic notification within a programmed time.

11. A method according to claim 1, wherein:

said step of coupling the CPU to the Worldwide Web includes coupling the CPU to a separate Web server.

12. A method according to claim 1, wherein:

said step of programming the CPU to store data includes programming the CPU to compress the data.

13. A method according to claim 12, wherein:

said step of programming the CPU to compress the data includes decimating data based on age of the data.

14. A method according to claim 13, wherein:

older data is decimated at a higher proportion than newer data.

15. An apparatus for remote real time oil field management, comprising:

- a) at least one sensor installed in an oil field;
- b) at least one CPU with memory located at the oil field coupled to said at least one sensor, said at least one CPU being programmed to collect data from said at least one sensor and store the data in said memory;
- c) communications means for coupling said CPU to the Worldwide Web; and
- d) server means for providing remote access to the data via the Worldwide Web.

16. An apparatus according to claim 15, wherein:

said CPU is programmed to at least partially analyze the data; and

said server means includes means for providing remote access to the at least partial analysis via the Worldwide Web.

17. An apparatus according to claim 15, wherein:

said CPU is programmed to determine whether data falls outside programmed bounds.

18. An apparatus according to claim 15, wherein:

said CPU is programmed to determine whether the data is following a trend.

19. An apparatus according to claim 15, wherein:

said CPU is programmed to determine whether a function of the data falls outside programmed limits.

20. An apparatus according to claim 15, wherein:

said CPU is programmed to apply a correlation function to the data.

21. An apparatus according to claim 15, wherein:
said CPU is programmed to determine covariance of the data.
22. An apparatus according to claim 16, wherein:
said CPU is programmed to determine whether the results of
the at least partial analysis correspond to an anomaly.
23. An apparatus according to claim 22, further comprising:
e) means for automatically notifying one or more persons when
the CPU determines that the results of the at least partial
analysis correspond to an anomaly.
24. An apparatus according to claim 23, wherein:
said means for automatically notifying is selected from the
group consisting of means for sending electronic mail, means for
calling a pager, means for calling a telephone number, means for
activating an alarm, means for broadcasting an RF signal, means
for transmitting a signal to a satellite, means for transmitting a
microwave signal, means for sending a signal via a LAN, and means
for sending a signal via a WAN.

25. An apparatus according to claim 23, further comprising:

- f) receiver means for receiving an acknowledgement of a notification by said means for automatically notifying;
- g) means for performing a specified function when said receiver means does not receive an acknowledgement in response to the notification within a programmed time.

26. An apparatus according to claim 15, wherein:

said step of coupling the CPU to the Worldwide Web includes coupling the CPU to a separate Web server.

27. An apparatus according to claim 15, further comprising:

- e) data compression means for compressing data stored by said CPU.

28. An apparatus according to claim 27, wherein:

said data compression means includes means for decimating data based on age of the data.

29. A method according to claim 6, wherein:

said step of programming the CPU to apply a correlation function includes programming the CPU to

i) let the active wells produce or inject with a nearly constant rate; and

ii) perform a periodic flowrate pulsing of the wells in a manner whereby the active wells are not pulsed at the same time or with the same amplitude.

30. A method according to claim 29, further comprising:

said step of programming the CPU to apply a correlation function includes programming the CPU to measure pressure response in the passive wells while pulsing in the active wells.

31. A method according to claim 30, further comprising:

said step of programming the CPU to apply a correlation function includes programming the CPU to differentiate the pressure responses.

32. A method according to claim 31, further comprising:

said step of programming the CPU to apply a correlation function includes programming the CPU to differentiate the flow rates.

33. A method according to claim 32, further comprising:

said step of programming the CPU to apply a correlation function includes programming the CPU to cross correlate differentiated data.

34. A method according to claim 33, further comprising:

said step of programming the CPU to apply a correlation function includes programming the CPU to determine a discernible peak in the cross correlated differentiated data.

35. A method according to claim 34, further comprising:

said step of programming the CPU to apply a correlation function includes programming the CPU to convert the data value at the peak to mobility.